Claims

1. A system for controlling flight of an aircraft comprising:

a sensor system disposed on the aircraft for sensing a position of the aircraft and an inertial movement of the aircraft, the sensor system being adapted to communicate sensed data representing the position and the inertial movement of the aircraft;

a receiver disposed on the aircraft and adapted to receive transmitted reference data communicating a position and movement of a reference vehicle;

commanded data representing a selected velocity of the aircraft relative to the reference vehicle; and

a control system disposed on the aircraft for calculating a calculated velocity of the aircraft relative to the reference vehicle using the sensed data and the reference data and for controlling flight-control devices on the aircraft, such that the aircraft attains and maintains a selected velocity relative to the reference vehicle corresponding to the commanded data.

2. The system according to claim 1, wherein the commanded data is preprogrammed into the control system prior to flight of the aircraft.

3. The system according to claim 1, wherein the receiver is further adapted to receive a transmission communicating the commanded data.

4. The system according to claim 3, wherein the commanded data is transmitted from the reference vehicle.

5. The system according to claim 3, wherein the commanded data is generated using a control station remote to the aircraft by manipulating a graphical user interface.

6. The system according to claim 3, wherein the commanded data is generated using a control station remote to the aircraft by manipulating a tactile user interface.

7. The system according to claim 1, wherein the transmitted data communicating the position and movement of the reference vehicle are transmitted from the reference vehicle.

8. The system according to claim 1, wherein the sensor system determines the position of the aircraft using a Global Positioning System receiver module.

9. A system for controlling the flight of an aircraft comprising:

sensors carried on the aircraft, the sensors being adapted to determine the position of the aircraft relative to the earth and the inertial movement of the aircraft, the sensors also being adapted to output data communicating the position and movement of the aircraft;

a receiver carried on the aircraft and adapted to receive transmitted data communicating the position of a reference vehicle relative to the earth and movement of the reference vehicle relative to the earth; and

a control system carried on the aircraft and connected to the sensors and the receiver, the control system calculating the position of the aircraft relative to the reference vehicle and movement of the aircraft relative to the reference vehicle using the data from the sensors and the data received by the receiver, the control system being adapted to command flight-control devices on the aircraft for causing the aircraft to maneuver in a manner that attains and maintains a selected position relative to the reference vehicle or a selected velocity relative to the reference vehicle.

10. The system according to claim 9, wherein the selected position and velocity of the aircraft relative to the reference vehicle is selected and input into the control system prior to flight of the aircraft.

11. The system according to claim 9, wherein the receiver is adapted to receive data communicating the selected position and velocity of the aircraft relative to the reference vehicle.

12. The system according to claim 11, wherein the data communicating the selected position and velocity of the aircraft relative to the reference vehicle is transmitted from the reference vehicle.

13. The system according to claim 9, wherein the data communicating the position and movement of the reference vehicle is transmitted from the reference vehicle.

14. The system according to claim 9, wherein the sensors determine the position of the aircraft using a Global Positioning System receiver module.

15. A method of controlling the flight of an aircraft, the method comprising the steps of:

(a) determining a position of the aircraft relative to the earth and an inertial movement of the aircraft using sensors carried on the aircraft;

(b) receiving transmitted data communicating a position of a reference vehicle relative to the earth and a movement of the reference vehicle relative to the earth using a receiver carried on the aircraft;

(c) using a control system carried on the aircraft to calculate a velocity of the aircraft relative to the reference vehicle by comparing data from the sensors and the transmitted data; and

(d) commanding flight-control devices on the aircraft with the control system, thereby causing the aircraft to attain and maintain a selected velocity relative to the reference vehicle.

16. The method according to claim 15, further comprising the step of:

prior to flight of the aircraft, inputting into the control system data communicating the selected position and velocity of the aircraft relative to the reference vehicle.

17. The method according to claim 15, further comprising the step of:

prior to step (d), receiving with the receiver a transmission containing data communicating the selected position and velocity of the aircraft relative to the reference vehicle.

18. The method according to claim 17, further comprising the step of:

transmitting from the reference vehicle the transmission communicating the selected position and velocity of the aircraft relative to the reference vehicle.

19. The method according to claim 15, further comprising the step of:

prior to step (b), transmitting the data communicating the position and movement of the reference vehicle from the reference vehicle.

20. A multi-vehicle system comprising:

a reference vehicle;

at least one aircraft;

a reference sensor system carried on the reference vehicle and adapted to determine the position relative to the earth and the movement relative to the earth of the reference vehicle;

an aircraft sensor system carried on each aircraft and adapted to determine the position relative to the earth and the inertial movement of each corresponding aircraft;

a receiver carried on each aircraft for receiving transmitted data communicating the position and movement of the reference vehicle; and

a control system carried on each aircraft adapted to calculate the velocity of each corresponding aircraft relative to the reference vehicle and adapted to command flight-control devices for causing each corresponding aircraft to fly at a selected velocity relative to the reference vehicle.

21. The multi-vehicle system according to claim 20 wherein the reference vehicle is a ship.

22. The multi-vehicle system according to claim 20 wherein the reference vehicle is a second aircraft.

23. The multi-vehicle system according to claim 20 wherein the reference vehicle is a land-based vehicle.

24. A flight control system for controlling the velocity of an aircraft relative to a reference vehicle comprising:

a control station carried by the reference vehicle; and

a hand-held controller;

wherein either the control station or the hand-held controller may be used to control the velocity of the aircraft relative to the reference vehicle.

25. The flight control system according to claim 24, wherein the hand-held controller includes tactile input devices.

26. A graphical display for controlling the velocity of an aircraft relative to a moving vehicle, comprising:

a moving-vehicle icon representing the moving vehicle;

a velocity-vector icon representing the actual velocity of the aircraft relative to the moving vehicle;

a commanded-relative-velocity icon representing a selected velocity of the aircraft relative to the moving vehicle;

wherein the velocity of the aircraft relative to the moving vehicle may be selectively controlled by moving the commanded-relative-velocity icon within the graphical display.

27. The graphical display according to claim 26, wherein the graphical display is programmed to generate signals for controlling the aircraft in response to the movements of the commanded-relative-velocity icon.

28. The graphical display according to claim 26, further comprising:

a relative-velocity-magnitude icon representing the velocity of the aircraft relative to the moving vehicle.

29. The graphical display according to claim 28, wherein the relative-velocity-magnitude icon is a plurality of circles concentric about the moving-vehicle icon.

30. The graphical display according to claim 26, wherein the velocity-vector icon changes in response to the movements of the commanded-relative-velocity icon, so as to represent the aircraft attaining and maintaining the selected velocity of the aircraft relative to the moving vehicle.

31. The graphical display according to claim 26, further comprising:

a polar coordinate system for indicating the heading of the moving vehicle.

32. The graphical display according to claim 26, further comprising:

a Cartesian coordinate system linked to the moving-vehicle icon to aid in selecting the movements of the commanded-relative-velocity icon.

33. The graphical display according to claim 26, further comprising:

an aircraft-location icon representing the current physical location of the aircraft relative to the moving vehicle.

34. The graphical display according to claim 26, further comprising:

a station-keeping icon representing a preprogrammed position or velocity of the aircraft relative to the moving vehicle.